App F IX 4

Previous References

1929. (Nemi)

File No. 81-29

Serial Nos. 7

Later References

General and Revenue Secretariat.

Serial Nos /

Part B for April 1930

SUBJECT

New Water Supply Scheme
Baneane Big

7 Government Order. No. PW 2955-66 – 11256 67 dated the 15th March 1930, sanctioning the Detailed estimates amounting to Rs 50.33 lakhs for the new Scheme of Water Supply to Baneane Big.

Initial
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Serial No 7

G.O No PW 29 5-66 — 11257 G. Dated 15 March 1930 sanctioning the Det Ld estimates Amounting to Rs 33 Lakh for the New Sch of Water Supply to Baneswar Cuttack

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25 MAR 1930

1) Submitted for perusal
24 3 3

2) Ch Engr) 28/3

3) Secy Member) 28/3

4) Fin Member ✓

5) CE 28/3

6) Mem 3/1/30

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LN —Com

(2)

THE MAHARAJA OF MYSORE

Public Works Department.

REV. 2
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Mc 81-29
Sec 7

Read:-

Government Order No. 130-60/1003-9 dated the 22nd February 1896, sanctioning the final estimate amounting to ₹ 19,50,931/= for the complete system of supply and distribution including the construction of the Chamarajendra Reservoir.

2. Agreement dated 17th February 1897, between the Secretary of State for India and His Highness the Maharaja of Mysore, regarding the supply of water from Chamarajendra Reservoir to the Civil and Military Station, Bangalore.

3. Agreement between the Secretary of State for India and His Highness the Maharaja of Mysore, dated the 17th January 1913, regarding the installation and operation of Jewell Gravity Filter Plant.

4. Agreement dated the 30th October 1920, revising the --- above Agreement.

5. Government Order No. M.3240 dated the 11th March 1926, sanctioning an estimate amounting to ₹ 3,06,555/= for raising the weir of the Chamarajendra Reservoir from R.L.65 to 70 by installing automatic gates, etc., and estimate amounting to ₹ 4,17,000/= for providing a Monier pipe duct.

6. Government Order No. P.W. 4001-5 dated the 8th May 1926, constituting a Committee to report on the Bangalore Water Supply.

7. Interim report of the Bangalore Water Supply Committee published for general information on 1st July 1927

8. The final report of the Committee received from the Secretary, Water Supply Committee, with his letter No.445 dated 17th --- May 1929.

9. Public Works Secretary's Note No.D.167 dated the 8th --- August 1929.

Order No. PW 2955-66/1125-6-67
Dated, Bangalore, the 15th March 1930.

The present source of water supply to Bangalore City and the Civil and ~~the~~ Military Station is the Chamarajendra Reservoir which was completed in the year 1897, at a cost of ₹ 19,50,931/= including the cost of distribution. Water was delivered to the City and the Civil & Military Station for the first time on 7th August 1896.

2. The Chamarajendra Reservoir was designed to give a sufficient supply for a population of 200,000 at 10 gallons per head per day. It was assumed at the time that this source would adequately meet the requirements of the City and the Civil and Military Station for a period of 20 years. The population of Bangalore as per Census of 1921 was 237,000.

3. The conditions under which water is supplied from this source to the Civil and Military Station are embodied in an Agreement dated the 17th February 1897. In accordance with para 8 of this Agreement, one million gallons per day was held to be sufficient supply for 7 years from the date of the 1897 Agreement; the quantity of such supply being determined once in 10 years thereafter. For the decade 1904-14 1½ million gallons per day each for the City and the Civil and Military Station was fixed as the sufficient quantity for the decade 1914-24 the quantity fixed was 1½ million gallons per day for each. The quantity considered sufficient for the decade 1924-34 has not been fixed and the same limit as was fixed for 1914-24 is being continued.

4. At the time the works were designed in 1892, the population of Bangalore was 180,366. The population as per Census of 1901 was 159,000. In 1911 it was 189,000 and in 1921 it was 237,496 (City 118,553 and Civil & Military Station 118,943). The consumption of water per head per day was assumed on the average at 10 gallons per head. Experience has shown that this is too low, and it has gradually worked up to 13 gallons per head. On account of the increase both in population and consumption, scarcity of water has been felt in Bangalore on a number of occasions since 1907. Since then various proposals have been made from time to time to improve the supply; the most important of which was increasing the storage by raising the weir of the Hessarghatta Tank from 3 to 5 feet. Underground sources of supply from bore-holes were examined with a view to supplementing the supply from the Lake.

5. In 1924, the Civil and Military Station Authorities obtained a report from Mr. C.F. Lallings of the Madras Public Works Department about the possibilities of improving the supply. He recommended

that the weirs of the lake may be raised by 8 feet, and estimated that by so doing Bangalore would be able to get a maximum supply of 6 million gallons per day, for 2 consecutive years with a minimum rain-fall.

6. The Government of Mysore accepted the proposal with certain modifications agreeing to raise the weir by only 5 feet. Estimates for raising the weirs and for laying a separate duct to have a carrying capacity of 6 million gallons per day amounting to ----- Rs 3,00,555/= and Rs 4,17,000/= respectively, were sanctioned in May 1920.

7. When arrangements were made to put the work in hand in accordance with the above estimates, it was found that the receipts into the Lake which were poor during the years 1923-24 had dwindled down to practically nothing in 1925. Arrangements were then made for augmenting the supply available in the Hesserghatta Tank by --- breaching some higher tanks in the valley and letting water into --- this tank. The expectations of better receipts in subsequent years based upon the experience of past years were not realised and therefore a temporary scheme of obtaining water supply from the Yelemallappa Chetty Tank was taken up in the early part of 1926. The --- water supply of Bangalore depended entirely at the time on this new source of supply, the Chamarajendra Reservoir having almost completely gone dry by May 1926.

8. In these circumstances, it was considered that there was no practical use in carrying out the scheme that had been sanctioned to raise the weirs of the Hessarghatta Lake. Government accordingly constituted a Committee in their Order No.4001-5 dated 8th May 1926, with Sir M. Visveswaraya as Chairman, and the marginally noted gentlemen as Members of the Committee to advise the Government as regards the measures to be adopted for the permanent improvement of the water supply of Bangalore.

1. Mr. V. Rangaswamy Iyengar.
2. " J. Bhore.
3. " L.R. Seshachar.
4. " S.G. Forbes.
5. " H.R.Venkatasubba Rao.

9. The Committee met a number of times and submitted their final report offering their definite recommendations in regard to this matter in May 1929.

10. Source of supply. - In the interim report of the Committee submitted in May 1927, all possible sources of supply that were examined by the Committee have been indicated. All the valleys round about Bangalore, such as the North Pinakini, the Arkavati and even the Cauvery and the Kenavati as possible sources of supply were taken up for investigation, to select a reliable and economical --- source of supply. The question of improving Hesserghatta Lake and supplementing it with another storage reservoir lower down in the -- same valley, was also examined. After considering all these ---- schemes, the Committee finally recommended that a Reservoir be constructed across the Arkavati river at Thippagondanahalli near the 20th mile of the Bangalore - Nagadi road just below its confluence with the Lakkudvati river for reasons mentioned in the above report. They consider that this scheme would provide a daily supply of 6 million gallons for a population of 300,000 immediately, and will be capable of supplying 9 to 10 million gallons per day later on, or at the same rate of consumption per head, viz., 20 gallons per day, for a population of 450,000. The catchment area is 532 Sq. Miles, of which the unintercepted area is 103 ~~xxxxx~~ Sq. Miles. According to the working tables enclosed with the report, the Reservoir at -- the final stage will, with the lowest minimum rainfall, be able to supply water at the maximum draw for 3 years and 10 months, and --- without replenishment for 3 years and 6 months respectively. The annual requirements of Bangalore are found to be 1072 M.C.Ft. From rough gaugings it is found that 2561 and 3576 M.C.Ft., of water --- flowed down the river during 1927 and 1928 against the receipts of 369 and 503 M.C.Ft. respectively, into the Hesserghatta Lake.

11. The supply in the stream is thus found to be ample for the maximum demand. Government approve of the recommendation to construct a reservoir across the Arkavati river at Thippagondanahalli.

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The Dam. - The Committee consider it desirable to proceed with the work of the Dam in two stages, the first stage to provide for a storage to supply 6 million gallons per day, and the second and final stage to provide 9 to 10 million gallons per day. They accordingly propose that the dam may be built to a height so as to impound 1471 M.C.Ft. This will ensure the supply of 6 million gallons per day as against the present supply of 3½ million gallons. The storage in the reservoir if once full, is expected to last for 6 years and 10 months with the minimum rainfall, and 2 years and 3 months without any replenishment. The Committee recommend that the dam may be built to the full section for the final stage and kept at the lower level to hold the above storage. Mr. Forbes suggested that the dam may be built once for all with a much smaller section to hold only 1824 M.C.Ft. against the ultimate storage of 3034 M.C.Ft. to supply 9 million gallons per day. The total quantity of water supply required ultimately including the incidental losses by absorption and evaporation is 1072 M.C.Ft. per annum, and for a water supply scheme of such an important and growing City like Bangalore, the source must be capable of supplying water for at least 3 successive poor years with little or no replenishment. For this reason the capacity of the reservoir will have to be sufficient to store the required quantity of water for this period. The storage proposed by Mr. Forbes would not meet such a demand. Further, the Arkavati valley has proved very disappointing during the last 7 or 8 years and no risks should be taken in this matter. Government accordingly agree with the Committee that the dam should be capable of being raised so as to hold ultimately a storage of 3038 M.C.Ft. and direct that the dam may be built to the full section up to the -- river bed level and above this with a suitable section to hold 1471 M.C.Ft.

13. Filters.- In accordance with the Agreement in force with the Civil and Military Station authorities, the maintenance expenditure at the Combined Jewell Filters is met in equal proportions, or in accordance with the quantities of filtered water drawn from the filters.

The present arrangement for filtration is not according to modern practice in as much as the unfiltered water is drawn through the mains from the two pumping Stations which are run independently by the City and the Civil and Military Station, and additional pumping from the pure water tanks at the filters has to be resorted to to supply the required quantity to the different service reservoirs. Further, a large quantity of water pumped is used for washing the filters every day. The present rate of filtration works out to 1.1 anna for 1000 gallons. If the filters are installed at the Pumping Station, and filtered water pumped through the main to the service reservoirs, the cost of filtration is expected to work out to .63 anna for a consumption of 4 million gallons and 0.53 of an anna, assuming consumption of 5 million gallons per day, and further, the deterioration of the main on account of pumping raw water will be greatly minimised. The Committee therefore recommend that Rapid Mechanical Filters may be installed at the Pumping Station at a cost of 3.53 lakhs.

Government accept the recommendation of the Committee.

14. Motors and Pumps. - The Committee's recommendation to have three units; each of the capacity of 3½ million gallons per day is approved.

15. The Rising Main. - After consideration of the discharge required and comparative cost of water for different diameters the Committee have resolved that a 27" main should be used.

16. Taking into consideration the manufacture of cast-iron pipes at the Mysore Iron Works, Bhadravati, the Committee have submitted a number of alternative estimates for the Rising Main limiting the length of cast-iron main to stand a pressureof 400, 500 and 600 ft. respectively, as also for providing an all-steel main. These estimates provide for :-

1. 10 miles of Cast Iron & 7 miles of Steel,
2. 13 -do- 4 -do-
3. 15 -do- 2 -do-
4. 17 miles of steel.

With a view to reducing the capital cost, Government are of ----

opinion that it is enough if the pumping equipment and the rising main are of sufficient capacity to meet the present and immediate future requirements. They direct that it will do if provision for 6 million gallons per day is made and accordingly approve of pumping units of 3½ million gallon capacity and a rising main of 24" diameter.

18. The whole scheme except the dam was referred to technical experts in London and they generally approve of the proposals made by the Committee. In regard to the limits of use of cast iron pipes manufactured at Bhadravati, they are of opinion that though the British -- Standard Specification prescribed a limit of maximum head of 400 feet, for ordinary cast iron pipe made of coke pig, the pipes of the Mysore Iron Works may be used up to a head of 500 feet in view of the better tests obtained of charcoal pig iron. But they also say that "to --- attain large pipes uniformly to this standard of strength will in our view call for particularly efficient and constant supervision at the foundry".

19. In accordance with the above opinion cast iron pipes can be used up to 13 miles.

Total cost of the scheme.

In accordance with the above, the total cost of the scheme works out to ₹ 50.33 lakhs as per details given below :-

(1)	Dam and allied works.	--	₹ 18 lakhs.
(2)	Pipe Line.	--	₹ 22.25 "
(3)	Filters.	--	₹ 3.53 "
(4)	Motors and Pumps.	--	₹ 1.23 "
(5)	Buildings.	--	₹ 1.23 "
		Total.	₹ 46.33 "
	Add interest during construction.	--	₹ 4.00 "
		Total.	₹ 50.33 "

The working expenses.

For a consumption of 4 million gallons a day which is not likely to be exceeded for the next 5 years the working expenses amount to -- 7 lakhs as per details noted below:-

			Rs
(1)	Interest at 5½ per cent.	--	2,77,000
(2)	Depreciation.	--	14,000
(3)	Repairs and renewals.	--	38,000
(4)	Power charges.	--	2,80,000
(5)	Filtration.	--	41,000
(6)	Maintenance.	--	50,000
	Total.		7,00,000

The rate for filtered water proposed to be levied for the City and the Civil & Military Station is 7.65 annas per 1,000 gallons for a guaranteed minimum consumption of 2 million gallons each. The total receipts on this account will be Rs 6,98,000.

Government are pleased to sanction the detailed estimates amounting to Rs 50.33 lakhs and direct that the arrangements be made to start the work at once.

A supplemental demand for Rs 5 lakhs required for expenditure during the current year may be placed before the next Meeting of the Legislative Council. The work may be spread over four years at the maximum, suitable grants being made for completing the principal works in 24 calendar months from the date of starting.

Government are pleased to record their high appreciation of the thoroughness with which the question has been dealt with in all its aspects by the Committee. They are pleased to convey their best thanks to Sir M. Visvesvaraya, the Chairman of the Committee, who very kindly agreed to guide the proceedings of the Committee in all its stages from the preparation of the estimates for the various works to the stage of the final recommendations, and to the Members of the Committee.

J. J. Bhore

Secretary to Government,
Public Works Department.

To

Sir M. Visvesvaraya, K.C.I.E.,
V. Rangaswamy Iyengar, Esq., B.C.L.,
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S.G. Forbes, Esq., B.Sc., &c.
H.R. Venkatasubba Rao, Esq., L.A., L.C.E.,
The Comptroller to the Govt. of Mysore through the Financial Secretary to Government (with file and two spare copies.)

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The Chief Electrical Engineer to the Government of Mysore.
The Chief Secretary to Government.
The General Secretary to Government.
The Executive Engineer, Bangalore Water Supply New Scheme.
The Executive Engineer, Water Supply Division.
The General Manager, Mysore Iron Works, Bhadravati.

N.J.P.